

IN THE CLAIMS:

The text of all pending claims, (including withdrawn claims) is set forth below. Cancelled and not entered claims are indicated with claim number and status only. The claims as listed below show added text with underlining and deleted text with ~~strike through~~. The status of each claim is indicated with one of (original), (currently amended), (cancelled), (withdrawn), (new), (previously presented), or (not entered).

Please AMEND the claims in accordance with the following:

1. (CURRENTLY AMENDED) A simulation apparatus for simulating, based on design information of a design model designed in a virtual three-dimensional space while one or more standard part models standardized in advance based on a specification model are arranged in the design model, working of a working means model to be used for the one or more standard part models arranged in the design model, comprising:

a working means model information storage section for storing working means model information which indicates details of the working means model to be used in working on the one or more standard part models, said working means model information being linked with standard part model information which indicates details of the one or more standard part models;

a working means model information extraction section for automatically referring, based on information regarding the standard part models arranged in a design model, to said working means model information storage section to extract information regarding a working means model to be used to work the standard part models arranged in the design model; and

a working simulation execution section for executing a simulation of the ~~working~~ for working of the standard part models with the working means model based on design information of the design model and the information regarding the working means model extracted by said working means model information extraction section, where the working means model is automatically selected from among plural other working means models pre-associated with the standard part models based on an automatic determination during the simulation that it satisfies an ideal working condition of the working means model.

2. (ORIGINAL) A simulation apparatus as claimed in claim 1, wherein the information regarding the standard part models arranged in the design model include attribute

information of the working means model related to the standard part models, and said working means model information extraction section refers to said working means model information storage section based on the attribute information to extract the information regarding the working means model.

3. (ORIGINAL) A simulation apparatus as claimed in claim 1, wherein said working means model information storage section stores information of one or more tool models which are models of actual tools and/or a hand model which is a model of a hand of a worker as the information regarding the working means model.

4. (ORIGINAL) A simulation apparatus as claimed in claim 1, wherein the information regarding the working means model stored in said working means model information storage section includes reference position information of the working means model when the working means model works the standard part models while the design information of the design model includes reference position information of the standard part models when the working means model works the standard part models, and said working simulation execution section performs a simulation of a relationship in position/posture of the working means model to the standard part models based on the reference position information of the working means model and the standard part models.

5. (CURRENTLY AMENDED) A simulation apparatus as claimed in claim 1, further comprising an interference checking section for checking interference of the working means model while said working simulation execution section executes a simulation of the ~~working~~ for working of the standard part models with the working means model.

6. (ORIGINAL) A simulation apparatus as claimed in claim 5, wherein said interference checking section checks interference of the working means model including a route along which the working means model arrives at one of the standard part models when the standard part model arranged in the design model is worked using the working means model.

7. (PREVIOUSLY AMENDED) A simulation apparatus as claimed in claim 2, further comprising a workability evaluation section for evaluating workability based on a result of

execution of the working simulation by said working simulation execution section and also based on information of the attribute of the working means model, where the workability indicates whether or an extent to which the working means model is able to work the one or more standard part models.

8. (CURRENTLY AMENDED) A simulation apparatus as claimed in claim 1, wherein said working means model information storage section stores information regarding a working condition necessary for ~~working for~~working of the working means model as information regarding the working means model, and said working simulation execution section executes a working simulation based on the information regarding the working condition of the corresponding working means model stored in said working means model information storage section.

9. (CURRENTLY AMENDED) A simulation apparatus for simulating, based on design information of a design model designed in a virtual three-dimensional space while one or more standard part models standardized in advance based on a specification model are arranged in the design model, ~~working for~~working of the standard part models arranged in the design model, comprising:

a working means model information storage section for storing working means model information which indicates details of a working means model to be used in working on the one or more standard part models, said working means model information being linked before simulating of the apparatus with standard part model information which indicates details of the one or more standard part models;

a working means model information extraction section for automatically referring, based on information regarding the standard part models arranged in a design model, to said working means model information storage section to extract information regarding a working means model to be used to work the standard part models arranged in the design model; and

a working simulation execution section for executing a simulation of the ~~working for~~working of the standard part models with the working means model based on design information of the design model and the information regarding the working means model extracted by said working means model information extraction section, wherein

said working means model information storage section stores information regarding a working condition necessary for ~~working for~~working of the working means model as information

regarding the working means model, and said working simulation execution section executes a working simulation based on the information regarding the working condition of the corresponding working means model stored in said working means model information storage section, wherein

said working means model information storage section stores information regarding working spaces necessary for working with the working means model as the information regarding the working conditions of the individual working means model, where the working means model is automatically selected from among plural other working means models pre-associated with the standard part models based on an automatic determination during the simulation that it satisfies an ideal working condition of the working means model.

10. (CURRENTLY AMENDED) A simulation apparatus for simulating, based on design information of a design model designed in a virtual three-dimensional space while one or more standard part models standardized in advance based on a specification model are arranged in the design model, ~~working for~~ working of the standard part models arranged in the design model, comprising:

a working means model information storage section for storing working means model information which indicates details of a working means model to be used in working on the one or more standard part models, said working means model information being linked with standard part model information which indicates details of the one or more standard part models;

a working means model information extraction section for automatically referring, based on information regarding the standard part models arranged in a design model, to said working means model information storage section to extract information regarding a working means model to be used to work the standard part models arranged in the design model; and

a working simulation execution section for executing a simulation of the ~~working for~~ working of the standard part models with the working means model based on design information of the design model and the information regarding the working means model extracted by said working means model information extraction section, wherein

the information regarding the working means model stored in said working means model information storage section includes reference position information of the working means model when the working means model works the standard part models while the design information of the design model includes reference position information of the standard part models when the

working means model works the standard part models, and said working simulation execution section performs a simulation of a relationship in position/posture of the working means model to the standard part models based on the reference position information of the working means model and the standard part models, wherein

said working means model information storage section stores information of a plurality of reference positions for any working means model which allows operation thereof in a plurality of different methods, and said working simulation execution section executes a working simulation according to the plurality of operation methods.

11. (CURRENTLY AMENDED) ~~A simulation apparatus as claimed in claim 7A~~
simulation apparatus for simulating, based on design information of a design model designed in a virtual three-dimensional space while one or more standard part models standardized in advance based on a specification model are arranged in the design model, working of a working means model to be used for the one or more standard part models arranged in the design model, comprising:

a working means model information storage section for storing working means model information which indicates details of the working means model to be used in working on the one or more standard part models, said working means model information being linked with standard part model information which indicates details of the one or more standard part models;

a working means model information extraction section for automatically referring, based on information regarding the standard part models arranged in a design model, to said working means model information storage section to extract information regarding a working means model to be used to work the standard part models arranged in the design model;

a working simulation execution section for executing a simulation of the working of the standard part models with the working means model based on design information of the design model and the information regarding the working means model extracted by said working means model information extraction section, wherein the information regarding the standard part models arranged in the design model include attribute information of the working means model related to the standard part models, and said working means model information extraction section refers to said working means model information storage section based on the attribute information to extract the information regarding the working means model; and

a workability evaluation section for evaluating workability based on a result of execution

of the working simulation by said working simulation execution section and also based on information of the attribute of the working means model, where the workability indicates whether or an extent to which the working means model is able to work the one or more standard part models, and

wherein said working means model information storage section stores information of a plurality of reference positions for any working means model which allows operation thereof in a plurality of different methods and said working simulation execution section executes a working simulation according to the plurality of operation methods while evaluating a workability for each of the operation methods of the working means model, and said workability evaluation section evaluates the workability of the working means model for the each of the working methods based on a result of execution of the working simulation according to the working method and also based on the information of the attribute, where the workability indicates whether or an extent to which the working means model is able to work the one or more standard part models.

12. (ORIGINAL) A simulation apparatus as claimed in claim 1, wherein at least one of a fastening part model, an adjustment part model and a connector part model is used for the standard part models.

13. (CURRENTLY AMENDED) A simulation method for simulating, based on data regarding a design model displayed in a virtual three-dimensional space and designed while one or more standard part models standardized in advance based on a specification model are arranged in the design model, workability according to a working means model used to work the standard part models arranged in the design model, comprising:

providing working means model information, which indicates details of a working means model to be used in working on the one or more standard part models, and standard part model information, which indicates details of the one or more standard part models, said working means model information being linked before simulating of the method with said standard part model information;

automatically acquiring the working means model, which is to be used in working on the individual standard part model, based on said working means model information linked with said standard part model information that indicates the details of the last-named individual standard part model;

executing a simulation of working to be performed for the standard part models using the acquired working means model; and

displaying a process of the execution of the simulation in a virtual three-dimensional space, where the working means model is automatically selected from among plural other working means models pre-associated with the standard part models based on an automatic determination during the simulation that it satisfies an ideal working condition of the working means model.

14. (CURRENTLY AMENDED) A simulation method as claimed in claim 13, wherein, as the simulation of the working to be performed for the standard part models, a simulation of at least one kind of working from among assembling working, disassembling working, adjustment working and maintenance ~~working for~~working of the standard part models is performed.

15. (ORIGINAL) A simulation method as claimed in claim 13, wherein, where a tool is used to work the standard part models, the tool and a hand of a worker who uses the tool are used as the working means model to perform the simulation of the working.

16. (ORIGINAL) A simulation method as claimed in claim 13, wherein, where the standard part models are to be worked by a hand of a worker itself, the hand of the worker is used as the working means model to perform the simulation of the working.

17. (ORIGINAL) A simulation method as claimed in claim 15, wherein, when the process of execution of the simulation of the working is displayed in the virtual three-dimensional space, the working means model is displayed in a shape suitable for an object of use in the virtual three-dimensional space.

18. (ORIGINAL) A simulation method as claimed in claim 16, wherein, when the process of execution of the simulation of the working is displayed in the virtual three-dimensional space, the working means model is displayed in a shape suitable for an object of use in the virtual three-dimensional space.

19. (ORIGINAL) A simulation method as claimed in claim 13, wherein a process

through which the working means model arrives at one of the standard part models which provides a subject position and a manner of working performed based on a condition defined in advance for the working means model are displayed as the process of execution of the simulation of the working.

20. (ORIGINAL) A simulation method as claimed in claim 19, wherein, after the working performed based on the condition defined in advance for the working means model is completed, a process through which the working means model is spaced away from the subject position based on a condition defined in advance for the standard part models is displayed, and after the working means model is spaced by a predefined distance away from the subject position, the display of the working means model or the working means model and the standard part models is erased.

21. (ORIGINAL) A simulation method as claimed in claim 13, wherein, when interference occurs with the working means model in a process of execution of the working to be performed for the standard part models with the working means model, an occurrence condition of the interference is displayed.

22. (CURRENTLY AMENDED) A computer-readable recording medium having a simulation program recorded thereon for causing, in order to cause a computer to execute, based on design information of a design model designed in a virtual three-dimensional space while one or more standardized standard part models are arranged in the design model, a simulation of working of a working means model used to work for the standard part models arranged in the design model, the computer to implement:

a function of providing working means model information, which indicates details of a working means model to be used in working on the one or more standard part models, and standard part model information, which indicates details of the one or more standard part models, said working means model information being linked with said standard part model information;

a function of automatically acquiring said working means model information, which is to be linked with the working means model to be used in working on the individual standard part models used upon designing of a design model;

a function of executing a simulation of working to be performed for the standard part models based on the acquired information of the working means model; and

a function of displaying a process of the execution of the simulation in a virtual three-dimensional space, where the working means model is automatically selected from among plural other working means models pre-associated with the standard part models based on an automatic determination during the simulation that it satisfies an ideal working condition of the working means model.

23. (CURRENTLY AMENDED) A designing supporting apparatus, comprising:

a standard part model information storage section for storing standard part model information regarding one or more standard part models standardized in advance based on a predetermined specification model; and

a designing supporting section for arranging one or more standard part models to perform supporting for designing a subject in a virtual three-dimensional space;

said designing supporting section including an attribute information extraction section for referring to said standard part model information storage section to automatically extract attribute information of a working means model to be used to work the standard part models arranged in the subject designed in the virtual three-dimensional space, and a design data outputting section for outputting data regarding the subject designed in the virtual three-dimensional space and data regarding the attribute information extracted by said attribute information extraction section as design data, said attribute information including working means model information, which indicates details of a working means model to be used in working on the one or more standard part models and which is linked with said standard part model information, where the working means model is automatically selected from among plural other working means models pre-associated with the standard part models based on an automatic determination during the simulation that it satisfies an ideal working condition of the working means model.

24. (CURRENTLY AMENDED) An apparatus for simulating work upon a model, comprising:

a design model comprised of a standard part model;

a working means model, separate from the design model, of a type generally capable of

mating with the standard part model, and having working requirements information for working the standard part model in a virtual three-dimensional space when mated with the standard part model;

arrangement information describing an arrangement of the working means model when it is arranged to be mated with the standard part model; and

a processing unit automatically determining whether or an extent to which the arranged working model can work the component model according to the arrangement information, the working requirements of the working means model, and according to the design model, where the working means model is automatically selected from among plural other working means models pre-associated with the standard part models based on an automatic determination during the simulation that it satisfies an ideal working condition of the working means model.

25. (PREVIOUSLY AMENDED) The apparatus according to claim 24, wherein the processing unit also automatically determines whether the working means model can be routed through the virtual three-dimensional space to its mated arrangement without interference between the moving working means model and the design model.

26. (CURRENTLY AMENDED) ~~The apparatus according to claim 25,~~ An apparatus for simulating work upon a model, comprising:

a design model comprised of a standard part model;

a working means model, separate from the design model, of a type generally capable of mating with the standard part model, and having working requirements information for working the standard part model in a virtual three-dimensional space when mated with the standard part model;

arrangement information describing an arrangement of the working means model when it is arranged to be mated with the standard part model; and

a processing unit automatically determining whether or an extent to which the arranged working means model can work the component model according to the arrangement information, the working requirements of the working means model, and according to the design model,

wherein the processing unit also automatically determines whether the working means model can be routed through the virtual three-dimensional space to its mated arrangement

without interference between the moving working means model and the design model, and

wherein orientation information is associated with the standard part model, and the determining whether the working means model can be routed in the virtual three-dimensional space to its mated arrangement further comprises automatically determining whether the working means model can approach the mating with the standard part model according to the orientation information and without interference from the main model.

27. (CURRENTLY AMENDED) A method for simulating, comprising:

arranging a working means model into a working arrangement, according to an arrangement of a standard part model that is part of a design model; ~~and~~

automatically determining whether or an extent to which the working means model, as arranged in its working arrangement, can work, in virtual three-dimensional space, the standard part model, by using the design model and working requirements of the working means model to automatically simulate the working means model working the standard part model; and

based on the automatic simulating, automatically determining whether, among plural working means models mate-able with the standard part model, the working means model is ideal for working the standard part model as arranged in the design model.

28. (PREVIOUSLY AMENDED) The method according to claim 27, further comprising determining whether a route of movement of the working means model to the arrangement with the standard part model can be performed without interference between the main model and the working means model.

29. (NEW) An apparatus according to claim 1, wherein the automatic determination is made by, for a particular standard part model, automatically simulating a working of the particular standard part model by two or more particular working means models, where the simulating is done with reference to an ideal working condition of each particular working means model, and where the particular working means models are automatically selected based on their pre-association with the particular standard part model.
